Small Business Innovation Research/Small Business Tech Transfer

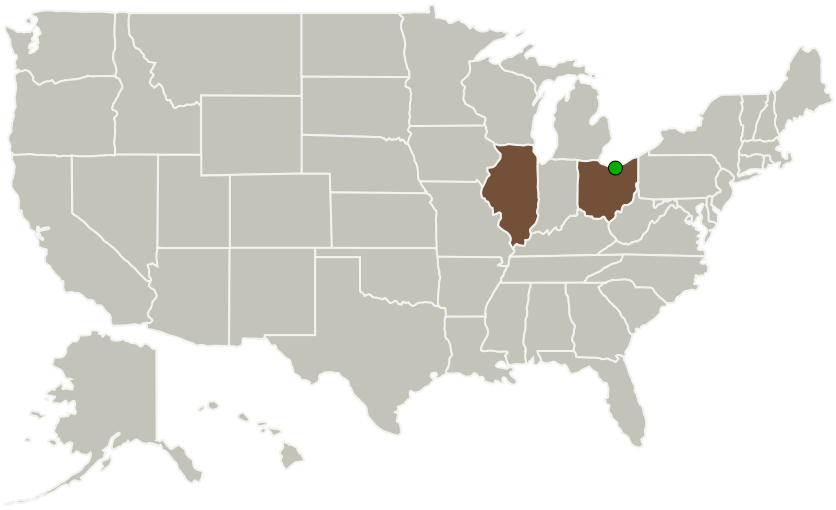
High Energy Long Life Betavoltaic Battery, Phase I

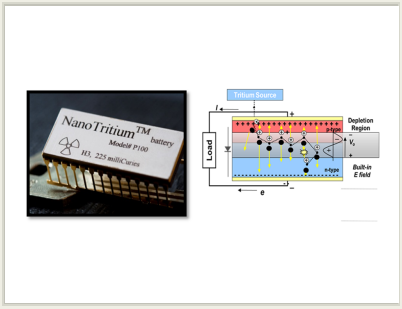
Completed Technology Project (2016 - 2016)

Project Introduction

The proposed innovation will dramatically improve the performance of tritium-powered betavoltaic batteries through the development of an ultra thin p on n junction composed of indium gallium phosphide coupled to a thin film metal tritide. The thin cell will be built using MicroLink's signature epitaxial lift off technology and standard metalorganic chemical vapor deposition (MOCVD) along with City Labs' tritium betavoltaic expertise. The proposed betavoltaic p/n junction can be stacked in a box or rolled into a cylinder and will provide a cost saving of up to 90%, while increasing energy density to up to twenty times that of lithium batteries. Such an advanced semiconductor device will produce much higher power outputs than are possible with existing state-of-the-art devices as illustrated in the Figure. It will provide the battery a life span in excess of 20 years with the broad-range temperature-insensitivity benefits normally associated with betavoltaics. This increased power/energy density for tritium betavoltaics will open up pathways for significant advances in power solutions for diminutive sized, low-power microelectronic devices that may be used in Cubesat and in-space power systems. Example applications include microwatt-to-milliwatt autonomous 20+ year sensors/microelectronics for use in structural monitoring, mesh networks, tagging and tracking wireless sensors, medical device implants, and deep space power where solar is not easily available. Tritium betavoltaics are capable of addressing this power niche for devices requiring reliable, uninterrupted power through extremes of temperature, longevity and diminutive form factors where traditional batteries cannot operate.

Primary U.S. Work Locations and Key Partners





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Completed Technology Project (2016 - 2016)

Organizations Performing Work	Role	Type	Location
MicroLink Devices, Inc.	Lead Organization	Industry Minority-Owned Business	Niles, Illinois
Glenn Research Center(GRC)	Supporting Organization	NASA Center	Cleveland, Ohio

Primary U.S. Work Locations	
Illinois	Ohio

Project Transitions

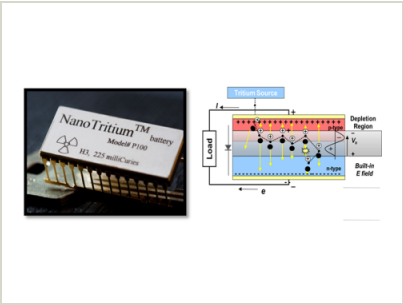
June 2016: Project Start

December 2016: Closed out

Closeout Documentation:

- Final Summary Chart*(https://techport.nasa.gov/file/139902)*

Images



Briefing Chart Image
High Energy Long Life Betavoltaic Battery, Phase I
(https://techport.nasa.gov/image/131205)

Organizational Responsibility

Responsible Mission Directorate:
Space Technology Mission Directorate (STMD)

Lead Organization:
MicroLink Devices, Inc.

Responsible Program:
Small Business Innovation Research/Small Business Tech Transfer

Project Management

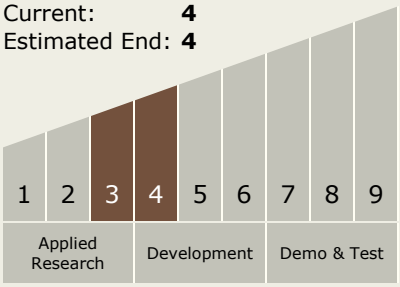
Program Director:
Jason L Kessler

Program Manager:
Carlos Torrez

Principal Investigator:
Glen Hillier

Technology Maturity (TRL)

Start: **3**
Current: **4**
Estimated End: **4**



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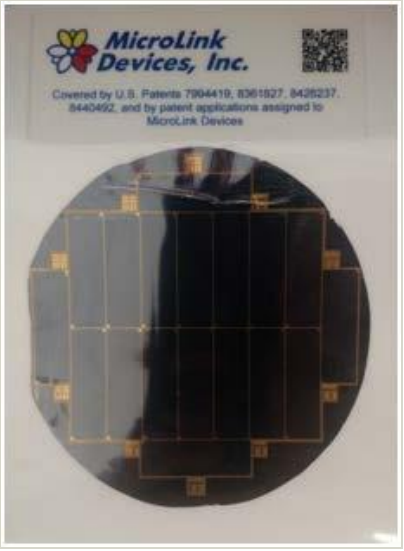

Final Summary Chart Image
High Energy Long Life Betavoltaic Battery, Phase I Project Image *(https://techport.nasa.gov/image/129278)*

Technology Areas

Primary:

- TX03 Aerospace Power and Energy Storage
  - TX03.1 Power Generation and Energy Conversion
    - TX03.1.1 Photovoltaic

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System